

219083



HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

Name of Site: Cabo Rojo Ground Water Contamination

CERCLIS ID No.: PRN000206319

Date Prepared: October 2010

Contact Persons

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Pathways, Components, or Threats Not Scored

The surface water, soil exposure, and air pathways were not scored because the listing decision is not significantly affected by those pathways. The site score is sufficient to list the site on the ground water pathway score.

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HRS DOCUMENTATION RECORD

Name of Site: Cabo Rojo Ground Water Contamination

CERCLIS ID No.: PRN000206319

EPA Region: 2

Date Prepared: October 2010

Street Address of Site: * Cross streets Calle Barbosa and Calle De Diego, Cabo Rojo, Puerto Rico 00623

County and State: Cabo Rojo Municipality, Puerto Rico

General Location in the State: southwestern Puerto Rico

Topographic Map: Puerto Real, PR

Ana Maria well:

Latitude: 18° 05' 26.61" North (18.09073°) Longitude: 67° 08' 53.97" West (-67.14832°)

Club de Leones well:

Latitude: 18° 05' 38.38" North (18.09399°) Longitude: 67° 07' 59.79" West (-67.13328°)

[Ref. 3, p. 1; 4, p. 1; 12, p. 1]

The site consists of a ground water plume with no identified source(s) of contamination. Therefore, the reference points for the site's latitude and longitude coordinates are the two wells with an observed release of contamination (i.e., the Ana Maria well and the Club de Leones well) [Figure 1; Ref. 1, p. 51595].

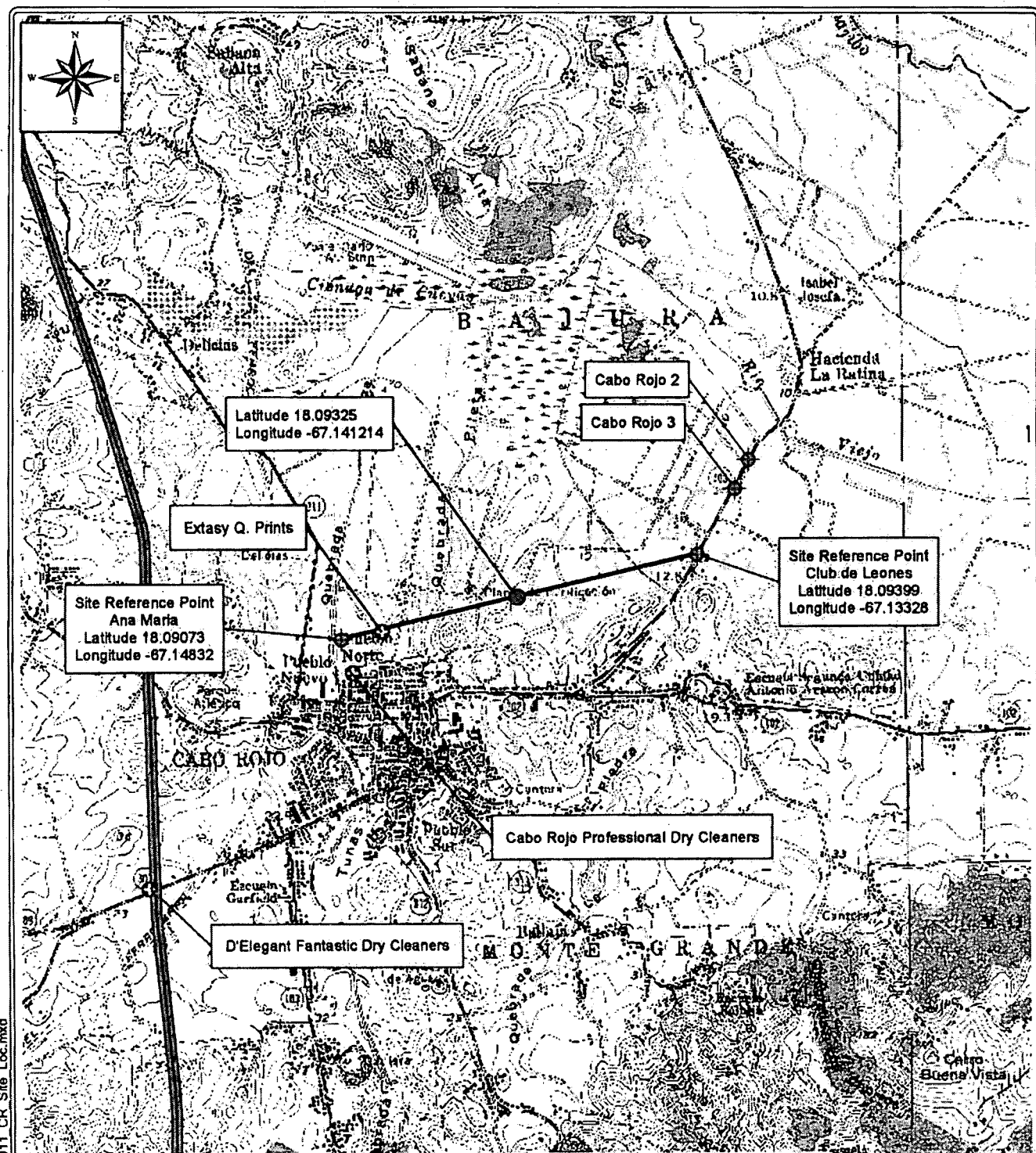
* The street address presented in this HRS documentation record identifies the nearest intersection to the Ana Maria well. The Ana Maria well is located approximately 660 feet (0.12 mile) northwest of the intersection of Calle Barbosa and Calle De Diego [Ref. 12, pp. 1-3].

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Scores

| | |
|-----------------------|------------|
| Ground Water Pathway | 100.00 |
| Surface Water Pathway | Not Scored |
| Soil Exposure Pathway | Not Scored |
| Air Pathway | Not Scored |

HRS SITE SCORE 50.00



SOURCES:

1. USGS 7.5 Minute Series Topographic Quadrangles: Puerto Real, PR; San German, PR.
2. Weston Solutions, Inc. (WESTON). Cabo Rojo Site Discovery Initiative Site Logbook, DCN No. SAT2.20113.030.001. June 30, 2006 - December 7, 2006.

TITLE:

Site Location Map
Cabo Rojo Ground Water Contamination
Cabo Rojo, Puerto Rico

PROJECT:

Cabo Rojo Ground Water Contamination

LEGEND:

- Well Location
- ⊕ Possible Source
- Area of Observed Ground Water Contamination
- Center of Area of Observed Ground Water Contamination

SCALE:

2,400 1,200 0 2,400
Feet

CLIENT NAME:

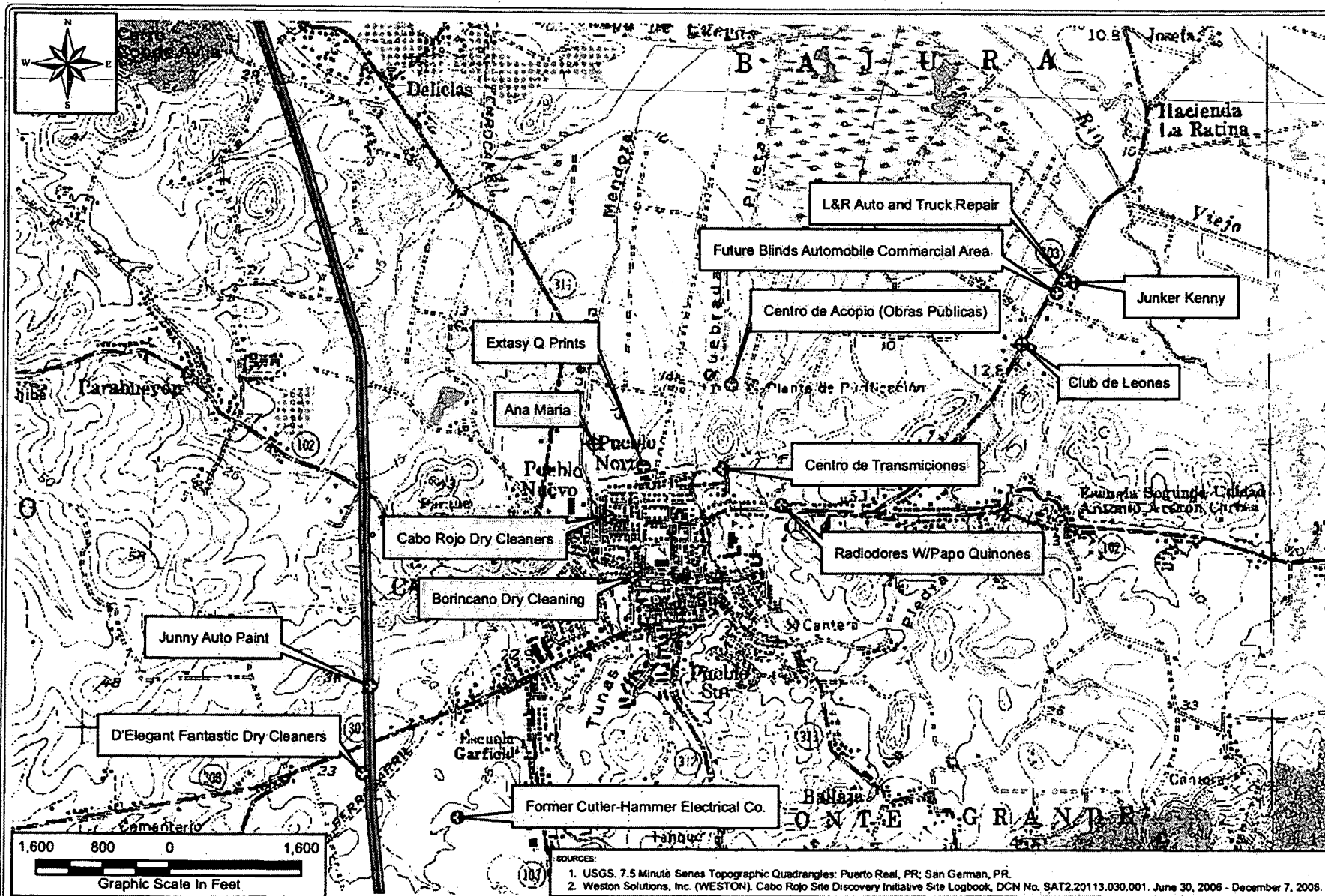
EPA

DATE:

June 2010

FIGURE #:

1



PROJECT: Cabo Rojo Ground Water Contamination

DATE: June 2010

FIGURE #: 2

LEGEND

- Well Location
- Preliminary Assessment/Site Inspection (PA/SI) Completed

CLIENT NAME:

EPA

TITLE:

Study Area Map
Cabo Rojo Ground Water Contamination
Cabo Rojo, Puerto Rico

WORKSHEET FOR COMPUTING HRS SITE SCORE
Cabo Rojo Ground Water Contamination

| | <u>S</u> | <u>S²</u> |
|---|-------------------|----------------------|
| 1. Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13) | <u>100.00</u> | <u>10,000</u> |
| 2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30) | <u>Not Scored</u> | |
| 2b. Ground Water to Surface Water Migration Component (from Table 4-25, line 28) | <u>Not Scored</u> | |
| 2c. Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score. | <u>Not Scored</u> | |
| 3. Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22) | <u>Not Scored</u> | |
| 4. Air Migration Pathway Score (S_a) (from Table 6-1, line 12) | <u>Not Scored</u> | |
| 5. Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$ | <u>10,000</u> | |
| 6. HRS Site Score Divide the value on line 5 by 4 and take the square root | <u>50.00</u> | |

GROUND WATER MIGRATION PATHWAY SCORESHEET
Cabo Rojo Ground Water Contamination

| GROUND WATER MIGRATION PATHWAY Factor Categories & Factors | MAXIMUM VALUE | VALUE ASSIGNED |
|---|---------------|----------------|
| Likelihood of Release to an Aquifer Aquifer: Bedrock Aquifer | | |
| 1. Observed Release | 550 | 550 |
| 2. Potential to Release | | |
| 2a. Containment | 10 | |
| 2b. Net Precipitation | 10 | |
| 2c. Depth to Aquifer | 5 | |
| 2d. Travel Time | 35 | |
| 2e. Potential to Release (lines 2a (2b+2c+2d)) | 500 | |
| 3. Likelihood of Release | 550 | 550 |
| Waste Characteristics | | |
| 4. Toxicity/Mobility | * | 10,000 |
| 5. Hazardous Waste Quantity | * | 100 |
| 6. Waste Characteristics | 100 | 32 |
| Targets | | |
| 7. Nearest Well | 50 | 50 |
| 8. Population | | |
| 8a. Level I Concentrations | ** | 18,560 |
| 8b. Level II Concentrations | ** | 7,509 |
| 8c. Potential Contamination | ** | NS |
| 8d. Population (lines 8a+8b+8c) | ** | 26,069 |
| 9. Resources | 5 | 5 |
| 10. Wellhead Protection Area | 20 | 20 |
| 11. Targets (lines 7+8d+9+10) | ** | 26,144 |
| 12. Targets (including overlaying aquifers) | ** | 26,144 |
| 13. Aquifer Score (lines 3x6x12 divided by 82,500) | 100 | 100 |
| GROUND WATER MIGRATION PATHWAY SCORE (Sgw) | 100 | 100.00 |

- * Maximum value applies to waste characteristics category.
 ** Maximum value not applicable.

REFERENCES

- | Reference Number | Description of the Reference |
|------------------|---|
| 1. | U.S. Environmental Protection Agency (EPA). <u>Hazard Ranking System, Final Rule</u> . Federal Register, Volume 55, No. 241. December 14, 1990. [137 pages] |
| 2. | EPA. <u>Superfund Chemical Data Matrix (excerpts), Methodology and Introduction, Appendix B-I (Hazardous Substances Factor Values), Appendix B-II (Hazardous Substances Benchmarks, and Appendix C (Synonyms) January 27, 2004 and Appendix A (Trichloroethylene (TCE) updates). October 23, 2006.</u> From http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm . Web Page last updated on May 26, 2010; Accessed and printed on June 3, 2010. [62 pages] |
| 3. | Capriglione, Michele, Weston Solutions, Inc. (Weston). <u>Project Note to Cabo Rojo Groundwater Contamination HRS File, Subject: Latitude and Longitude Determination</u> . March 16, 2010. [1 page] |
| 4. | U.S. Department of the Interior Geological Survey (USGS). <u>Puerto Real Quadrangle, Puerto Rico, 7.5-Minute Series (Topographic)</u> . 1966. [1 page] |
| 5. | Capriglione, Michele, Weston. <u>Project Note to Cabo Rojo Groundwater Contamination HRS File, Subject: Compilation of analytical data sheets from 2002-2006 of Volatile Organic Compounds (VOCs) analyses obtained from Puerto Rico Aqueduct and Sewer Authority (PRASA)</u> . June 3, 2010. [18 pages] |
| 6. | Capriglione, Michele, Weston. <u>Project Note to Cabo Rojo Groundwater Contamination HRS File, Subject: Populations associated with the Ana Maria and Club de Leones Well (with Attached References)</u> . June 1, 2010. [7 pages] |
| 7. | Capriglione, Michele, Weston. <u>Sampling Trip Report, Work Assignment No.: 030, Cabo Rojo Site Discovery Initiative</u> . July 19, 2006. [23 pages] |
| 8. | EPA Hazardous Waste Support Section/Regional Sample Control Center. <u>Record of Communication to HWSS/ESAT-TOPO and attached CLP Data Assessment, Subject: CLP [Organic] Data Package for Quality Assurance Review, Site: Cabo Rojo SDI, Case #: 35509</u> . August 10–August 29, 2006. [257 pages] |
| 9. | Weston. <u>Site Logbook. Cabo Rojo Site Discovery Initiative Logbooks. WO: 20113.111.002.0030.00, DCN: SAT2.20113.030.001 and SAT2.20113.030.002</u> . June 30, 2006 through December 7, 2006. [61 pages] |
| 10. | Puerto Rico Environmental Quality Board (PREQB). <u>Final Wellhead Protection Program</u> . April 1991. [103 pages] |
| 11. | EPA. <u>Region 2 Water, Wellhead Protection Program</u> . From http://www.epa.gov/region02/water/whp.htm . Web Page last updated on August 28, 2009; Accessed and printed on February 23, 2010. [1 page] |
| 12. | Capriglione, Michele, Weston. <u>Project Note to Cabo Rojo Groundwater Contamination HRS File, Subject: Location of the Ana Maria Well in relation to the street address of the site (with Attached References)</u> . August 10, 2010. [3 pages] |
| 13. | Capriglione, Michele, Weston. <u>Project Note to Cabo Rojo Groundwater Contamination HRS File, Subject: Compilation of Well Construction Details (with Attached References)</u> . July 23, 2010. [13 pages] |
| 14. | Weston. <u>Site Logbook. Cabo Rojo Groundwater Contamination HRS Logbook. WO: 20113.111.002.0125.00, DCN: SAT2.20113.125.001</u> . September 2, 2009. [6 pages] |

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| 16. | EPA Hazardous Waste Support Section/Regional Sample Control Center. <u>Record of Communication to HWSS/ESAT-TOPO and attached CLP Data Assessment, Subject: CLP [Organic] Data Package for Quality Assurance Review, Site: Cabo Rojo Groundwater Contamination, Case #: 38927. September 23-October 5, 2009. [25 pages]</u> |
| 17. | Snyder, Scott, Weston. <u>Project Note to D'Elegant Fantastic Dry Cleaners File (with attached field documentation), Subject: Compilation of Site Field Notes. August 29, 2007. [44 pages]</u> |
| 18. | Gaughan, Daniel J., Weston. <u>Sampling Trip Report. Work Assignment No.: 066, D'Elegant Fantastic Dry Cleaners. July 5, 2007. [12 pages]</u> |
| 19. | EPA Hazardous Waste Support Section/Regional Sample Control Center. <u>Record of Communication to HWSS/ESAT-TOPO and attached CLP Data Assessment, Subject: CLP [Organic] Data Package for Quality Assurance Review, Site: D'Elegant Fantastic Dry Cleaners, Case #: 36469. July 6-12, 2007. [74 pages]</u> |
| 20. | Snyder, Scott, Weston. <u>Project Note to Extasy Q Prints File (with attached field documentation), Subject: Compilation of Site Field Notes. August 30, 2007. [55 pages]</u> |
| 21. | Gaughan, Daniel J., Weston. <u>Sampling Trip Report. Work Assignment No.: 070, Extasy Q Prints. July 5, 2007. [16 pages]</u> |
| 22. | EPA Hazardous Waste Support Section/Regional Sample Control Center. <u>Record of Communication to HWSS/ESAT-TOPO and attached CLP Data Assessment, Subject: CLP [Organic] Data Package for Quality Assurance Review, Site: Extasy Q Prints, Case #: 36476. July 18-August 14, 2007. [94 pages]</u> |
| 23. | Snyder, Scott, Weston. <u>Project Note to Cabo Rojo Professional Dry Cleaners File (with attached field documentation), Subject: Compilation of Site Field Notes. August 29, 2007. [45 pages]</u> |
| 24. | Gaughan, Daniel J., Weston. <u>Sampling Trip Report. Work Assignment No.: 067, Cabo Rojo Professional Dry Cleaners. July 10, 2007. [15 pages]</u> |
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| 26. | Capriglione, Michele, Weston. <u>Pre-CERCLIS Screening Report, Cabo Rojo Site Discovery Initiative, Cabo Rojo, Puerto Rico, Document Control No. SAT2.20113.030.330 (without appendices). Prepared for United States Environmental Protection Agency. February 2007. [35 pages]</u> |
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| 30. | Rodríguez-Martínez, Jesus, USGS. <u>Hydrology and Ground-Water/Surface-Water Relations in the Bajura Area of the Municipio of Cabo Rojo, Southwestern Puerto Rico.</u> Water-Resources Investigations Report 95-4159. Prepared in cooperation with Puerto Rico Aqueduct and Sewer Authority (PRASA). 1996. [36 pages] |
| 31. | Veve, Thalia D., USGS. <u>Atlas of Ground-Water Resources in Puerto Rico and the U.S. Virgin Islands, Section 2.3.2: Guanajibo Region; excerpts.</u> Water Resources Investigations Report 94-4198. Prepared in cooperation with EPA. 1996. [24 pages] |
| 32. | USEPA, Contract Laboratory Program. <u>National Functional Guidelines for Superfund Organic Methods Data Review; excerpt.</u> June 2008. [6 pages] |
| 33. | USEPA, Contract Laboratory Program. <u>Statement of Work for Organic Analysis Multi-Media, Multi-Concentration SOM01.1; Exhibit B.</u> May 2005. [9 pages] |
| 34. | EPA, Envirofacts Warehouse. <u>MultiSystem Report, Cabo Rojo Professional Dry Cleaners.</u> From http://oaspub.epa.gov/enviro/multisys2.get_list?facility_uin=110028288500 . Web page last updated, accessed, and printed on April 8, 2010. [1 page] |
| 35. | EPA, Envirofacts Warehouse. <u>MultiSystem Report, D'Elegant Fantastic Dry Cleaners.</u> From http://oaspub.epa.gov/enviro/multisys2.get_list?facility_uin=1100282885234 . Web page last updated, accessed, and printed on April 8, 2010. [1 page] |
| 36. | EPA, Envirofacts Warehouse. <u>MultiSystem Report Modern Man Dry Cleaners.</u> From http://oaspub.epa.gov/enviro/multisys2.get_list?facility_uin=110014361519 . Web page last updated, accessed, and printed on April 8, 2010. [2 pages] |
| 37. | Capriglione, Michele, Weston. <u>Project Note to Cabo Rojo Groundwater Contamination HRS File, Subject: Summary of the Cabo Rojo Source Investigation.</u> July 29, 2010. [1 page] |
| 38. | Gaughan, Daniel J., Weston. <u>Sampling Trip Report. Work Assignment No.: 079, Borincano Dry Cleaning.</u> July 6, 2007. [10 pages] |
| 39. | EPA Hazardous Waste Support Section/Regional Sample Control Center. <u>Record of Communication to HWSS/ESAT-TOPO and attached CLP Data Assessment, Subject: CLP [Organic] Data Package for Quality Assurance Review, Site: Borincano Dry Cleaning, Case #: 36479.</u> July 12-25, 2007. [58 pages] |
| 40. | Gaughan, Daniel J., Weston. <u>Sampling Trip Report. Work Assignment No.: 072, Centro de Acopio (Obras Publicas).</u> July 5, 2007. [23 pages] |

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| 42. | Gaughan, Daniel J., Weston. <u>Sampling Trip Report. Work Assignment No.: 073, Centro de Transmisiones.</u> July 10, 2007. [16 pages] |
| 43. | EPA Hazardous Waste Support Section/Regional Sample Control Center. <u>Record of Communication to HWSS/ESAT-TOPO and attached CLP Data Assessment, Subject: CLP [Organic] Data Package for Quality Assurance Review, Site: Centro de Transmisiones, Case #: 36468.</u> July 10-20, 2007. [60 pages] |
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| 47. | Gaughan, Daniel J., Weston. <u>Sampling Trip Report. Work Assignment No.: 078, Future Blinds Automobile Commercial Area.</u> July 10, 2007. [18 pages] |
| 48. | EPA Hazardous Waste Support Section/Regional Sample Control Center. <u>Record of Communication to HWSS/ESAT-TOPO and attached CLP Data Assessment, Subject: CLP [Organic] Data Package for Quality Assurance Review, Site: Future Blinds Automobile Commercial, Case #: 36475.</u> July 17, 2007-August 6, 2007. [292 pages] |
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| 50. | EPA Hazardous Waste Support Section/Regional Sample Control Center. <u>Record of Communication to HWSS/ESAT-TOPO and attached CLP Data Assessment, Subject: CLP [Organic] Data Package for Quality Assurance Review, Site: Junny Auto Paint, Case #: 36474.</u> July 20, 2007-August 15, 2007. [199 pages] |
| 51. | EPA Hazardous Waste Support Section/Regional Sample Control Center. <u>Record of Communication to HWSS/ESAT-TOPO and attached CLP Data Assessment, Subject: CLP [Organic] Data Package for Quality Assurance Review, Site: Junny Auto Paint, Case #: 36474.</u> July 13-31, 2007. [161 pages] |
| 52. | Gaughan, Daniel J., Weston. <u>Sampling Trip Report. Work Assignment No.: 074, Junker Kenny Inc.</u> July 11, 2007. [14 pages] |

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| Reference Number | Description of the Reference |
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| 54. | Gaughan, Daniel J., Weston. <u>Sampling Trip Report. Work Assignment No.: 076, L & R Auto and Truck Repair,</u> July 11, 2007. [13 pages] |
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| 61. | Capriglione, Michele, Weston. <u>Project Note to Cabo Rojo Groundwater Contamination HRS File, Subject: Determination of Hydraulic Conductivity for the Ana Maria and Club de Leones wells (with Attached References).</u> July 27, 2010. [14 pages] |

SITE SUMMARY

The Cabo Rojo Ground Water Contamination site (CERCLIS ID No. PRN000206319) consists of a ground water plume with no identified source(s) of contamination [Ref. 12, p. 2]. It is located in the municipality of Cabo Rojo in southwestern Puerto Rico [Figure 1; Ref. 4, p. 1; 12, p. 2]. The reference points for the site are the two wells with an observed release of contamination, Ana Maria and Club de Leones [Figure 1; Ref. 1, p. 51595; 3, p. 1]. The geographic coordinates of the Ana Maria well are 18.09073° latitude and -67.14832° longitude and the coordinates of the Club de Leones well are 18.09399° latitude and -67.13328° longitude [Figure 1; Ref. 3, p. 1].

The Cabo Rojo Urbano public water system consists of six wells (Hacienda la Margarita, Cabo Rojo 1, Cabo Rojo 2, Cabo Rojo 3, Club de Leones, and Ana Maria) and one surface water source which serve an estimated population of 46,911 people [Ref. 6, pp. 1, 6]. The Ana Maria well acts as an independent system which serves approximately 1,856 persons; the other components are blended to serve approximately 45,055 persons [Ref. 6, p. 1]. Quarterly ground water samples collected by the system's operator, Puerto Rico Aqueduct and Sewer Authority (PRASA), indicate that the chlorinated solvents tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected in samples collected from the Hacienda la Margarita well in 2004 and 2005 and on numerous occasions in samples collected from the Ana Maria well from 2002 to 2006 [Ref. 5, pp. 1-18]. PCE was detected in ground water samples collected from the Ana Maria well at concentrations ranging from 1.8 micrograms per liter ($\mu\text{g/L}$) to 4.0 $\mu\text{g/L}$ and TCE was detected at concentrations ranging from 0.5 $\mu\text{g/L}$ to 1.6 $\mu\text{g/L}$ [Ref. 5, pp. 1-10, 12, 14, 16-18].

The U.S. Environmental Protection Agency (EPA) collected 13 ground water samples from active public and private supply wells in and around Cabo Rojo (including the six public supply wells which comprise the Cabo Rojo Urbano system) in July 2006 [Ref. 6, p. 1; 7, pp. 2-5, 7, 9-15, 18-21; 9, pp. 7-17]. In all instances ground water samples were collected prior to treatment (i.e., chlorination) [Ref. 9, p. 8]. In most cases samples were collected from the spigot designated for raw water sampling; however, where the spigot was not present (i.e., CR-GW03 collected from Cabo Rojo 3), the sample was collected directly from a pipe on the well, prior to chlorination [Ref. 7, p. 5; 9, pp. 8, 10]. Chlorinated solvents were detected in ground water samples collected from the Ana Maria and the Club de Leones wells but were not detected in the other wells tested including the Hacienda la Margarita well [Ref. 7, p. 5; 8, pp. 1-34, 51, 52, 57, 69-70, 251, 252; 9, p. 10]. Ground water sample CR-GW04, collected from the Ana Maria well, indicated the presence of PCE (1.9 $\mu\text{g/L}$), TCE (0.63 $\mu\text{g/L}$), and cis-1,2-dichloroethylene (cis-1,2-DCE) (0.67 $\mu\text{g/L}$) [Ref. 7, p. 5; 8, pp. 51, 52; 9, p. 10]. Duplicate sample CR-GW14, also collected from the Ana Maria well, revealed similar detections of PCE (1.9 $\mu\text{g/L}$), TCE (0.62 $\mu\text{g/L}$), and cis-1,2-DCE (0.66 $\mu\text{g/L}$) [Ref. 7, p. 5; 8, pp. 69-70, 251; 9, p. 10]. Ground water sample CR-GW06, which was collected from the Club de Leones well, indicated the presence of 1,1-dichloroethylene (1,1-DCE) at 0.96 $\mu\text{g/L}$ [Ref. 7, p. 5; 8, p. 57; 9, p. 10]. Chlorinated solvents were not detected in any other ground water samples collected in July 2006, including ground water samples CR-GW02 and CR-GW03, collected from public supply wells Cabo Rojo 2 and Cabo Rojo 3, respectively [Ref. 7, pp. 5, 7; 8, pp. 1-34, 42-80; 9, pp. 7-17; 32, p. 6]. Ground water samples CR-GW02 and CR-GW03 indicated non-detect values for PCE, TCE, cis-1,2-DCE, and 1,1-DCE and were chosen to demonstrate background ground water conditions [Ref. 7, pp. 5, 7; 8, pp. 45-46, 48-49, 250; 9, p. 10; 32, p. 6].

From November 29 through December 7, 2006, EPA conducted site reconnaissance activities at 68 facilities within the municipality of Cabo Rojo [Ref. 9, pp. 18-40, 43-61; 26, pp. 8-33]. Based on the results of the reconnaissance activities, EPA identified 15 facilities for further investigation [Ref. 26, p. 34; 37, p. 1]. In January 2007, EPA conducted source investigations at fifteen facilities in Cabo Rojo which were identified as potential sources of the ground water contamination [Ref. 37, p. 1]. Although chlorinated solvents (i.e., PCE, TCE, cis-1,2-DCE, trans-1,2-dichloroethylene [trans-1,2-DCE], and vinyl chloride) were detected at three of these facilities, EPA did not identify the source of ground water contamination in the public supply wells as contamination was not detected in both a source and ground water release at two of the facilities, and a connection between a release at the third facility and the ground water plume impacting the public wells could not be established [Ref. 19, pp. 13-14, 34-35; 37-38; 22, pp. 39, 42, 45; 25, pp. 9, 18, 21].

In September 2009, EPA collected additional ground water samples from the wells Ana Maria and Club de Leones and from two background wells (i.e., Cabo Rojo 2 and Cabo Rojo 3) [Ref. 14, pp. 4-5]. PCE was detected at 1.1 $\mu\text{g/L}$ in aqueous sample CRGC-GW01 and its duplicate CRGC-GW02 collected from the Ana Maria well [Ref. 14, p. 5; 15, p. 4; 16, pp. 1, 3, 6, 20-25]. Ground water sample CRGC-GW03 collected from the Club de Leones well indicated the

presence of 1,1-DCE at an estimated concentration [Ref. 14, p. 5; 15, p. 4; 16, pp. 11, 21, 25; 32, p. 6]. Analytical results for ground water samples CRGC-GW04 and CRGC-GW05, collected from designated background public supply wells Cabo Rojo 2 and Cabo Rojo 3, respectively, indicated non-detect values for PCE and 1,1-DCE [Ref. 14, pp. 4, 5; 15, p. 4; 16, pp. 1, 14-15 20-25, 17-18; 32, p. 6].

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Number of the source:

1

Source Type of the source:

Other

Name and description of the source:

Ground Water Plume – Cabo Rojo, Puerto Rico

Source 1 is a contaminated ground water plume of unknown volume without an identified source. As shown in Section 2.4.1, sampling results indicate the continuing presence of chlorinated solvents in two public supply wells.

A ground water sample (CR-GW04) collected by EPA in July 2006 indicated the presence of PCE (1.9 µg/L) and TCE (0.63 µg/L) in the Ana Maria well; cis-1,2-DCE was also detected in this well at a concentration of 0.67 µg/L [Ref. 7, p. 5, 11; 8, pp. 51-52; 9, p. 10]. A ground water sample collected from the Club de Leones well (CR-GW06), a component of the Cabo Rojo Urbano public water system, indicated the presence of 1,1-DCE at 0.96 µg/L [Ref. 6, pp. 1, 3; 7, pp. 5, 12; 8, p. 57; 9, p. 10]. Analytical results of public supply wells Cabo Rojo 2 and Cabo Rojo 3, which were selected to establish background levels for the contaminated wells, indicated non-detect values for PCE, TCE, cis-1,2-DCE, and 1,1-DCE [Ref. 7, pp. 5, 7; 8, pp. 45-46, 48-49; 9, p. 10; 32, p. 6].

In September 2009, EPA collected additional ground water samples from Ana Maria, Club de Leones, Cabo Rojo 2 and Cabo Rojo 3 [Ref. 14, p. 5]. PCE was detected at 1.1 µg/L in aqueous sample CRGC-GW01 and its duplicate CRGC-GW02 collected from the Ana Maria well [Ref. 14, p. 5; 15, p. 4; 16, pp. 3, 6]. Ground water sample CRGC-GW03 collected from the Club de Leones well indicated the presence of an estimated concentration of 1,1-DCE [Ref. 14, pp. 4, 5; 15, p. 4; 16, p. 11; 32, p. 6]. Analytical results of ground water samples CRGC-GW04 and CRGC-GW05 collected from designated background public supply wells Cabo Rojo 2 and Cabo Rojo 3, respectively, indicated non-detect values for PCE and 1,1-DCE [Ref. 14, pp. 4-5; 15, p. 4; 16, pp. 14-15, 17-18; 32, p. 6].

EPA collected a total of 61 surface soil samples, 66 subsurface soil samples and 28 ground water samples from twelve facilities in an effort to identify potential sources of ground water contamination in Cabo Rojo [Ref. 18, pp. 3-5; 21, pp. 3, 5-6; 24, pp. 3-6; 38, pp. 3-4; 40, pp. 3-7; 42, pp. 3, 5; 45, pp. 3-7; 47, pp. 3-7; 49, pp. 3-7; 52, pp. 3, 5; 54, pp. 3-5; 56, pp. 3-7]. Samples collected from nine of these facilities did not indicate the presence of chlorinated solvents in soil or ground water samples; therefore these facilities are no longer considered possible sources of ground water contamination [Ref. 39, pp. 35-58; 41, pp. 37-93; 43, pp. 27-60; 44, pp. 117-122; 46, pp. 38-48, 202-246; 48, pp. 165-212; 50, pp. 30-59; 51, pp. 41-52; 53, 146-166; 55, pp. 41-61; 57, pp. 119-163]. Chlorinated solvents (i.e., PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride) were detected at the three remaining facilities; however, no facility in the immediate area of either the Ana Maria well or Club de Leones well had VOC contamination detected in both soil and ground water samples [Figure 2; Ref. 19, pp. 13-14, 34-35, 37-38; 22, pp. 39, 42, 45; 25, pp. 9, 18, 21]. The Attribution portion of the Observed Release (Section 3.1.1) of this documentation record provides more supporting detail.

The Ana Maria well, which acts as an independent system, serves approximately 1,856 persons [Ref. 6, p. 1; 14, p. 3]. The Club de Leones well, associated with PRASA's Cabo Rojo Urbano Water interconnected system, serves approximately 7,509 persons [Ref. 6, p. 1]. Quarterly ground water samples collected by PRASA, indicate that the chlorinated solvents PCE and TCE were detected in the Ana Maria well during the period 2002 to 2006 [Ref. 5, pp. 1-10, 12, 14, 16-18]. The maximum concentrations of PCE and TCE detected in these wells during this period were 4.0 µg/L and 1.6 µg/L, respectively [Ref. 5, pp. 1, 3].

Location of the source, with Reference to a map of the site:

The ground water plume is identified by contamination found in the Ana Maria and Club de Leones public supply wells. For the purpose of this documentation record, these wells represent a minimum of the plume extent. The hazardous substances associated with the Ana Maria well and the Club de Leones well are linked due to biodegradation (i.e., the anaerobic dechlorination of PCE proceeds via TCE to DCE) [Ref. 27, p. 8]. The well locations are shown in Figure 1. Cabo Rojo is located in the southwestern portion of Puerto Rico [Ref. 4, p. 1].

Containment

Release to ground water:

Based on evidence of hazardous substance migration (i.e., contamination detected in ground water samples collected from two public supply wells) a containment factor of 10 is assigned [Ref. 1, p. 51596; 7, p. 5; 8, pp. 51-52, 57; 9, p. 10; 14, p. 5; 15, p. 4; 16, pp. 2-3, 5-6, 11].

2.4.1 Hazardous Substances

Ground water samples collected by EPA in 2006 and 2009 show the presence of chlorinated solvents in two public supply wells, as described below. Background sample locations and contaminant levels for comparison to the contaminated samples collected during EPA's 2006 and 2009 sampling events are discussed in Section 3.1.1 of this document. EPA collected surface soil samples, subsurface soil samples, and ground water samples from twelve facilities in an effort to identify potential sources of ground water contamination in Cabo Rojo [Ref. 18, pp. 3-5; 21, pp. 3, 5-6; 24, pp. 3-6; 38, pp. 3-4; 40, pp. 3-7; 42, pp. 3, 5; 45, pp. 3-7; 47, pp. 3-7; 49, pp. 3-7; 52, pp. 3, 5; 54, pp. 3-5; 56, pp. 3-7]. Samples collected from nine of these facilities did not indicate the presence of chlorinated solvents in soil or ground water samples [Ref. 39, pp. 35-58; 41, pp. 37-93; 43, pp. 27-60; 44, pp. 117-122; 46, pp. 38-48, 202-246; 48, pp. 165-212; 50, pp. 30-59; 51, pp. 41-52; 53, 146-166; 55, pp. 41-61; 57, pp. 119-163]. Chlorinated solvents (i.e., PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride) were detected at the three remaining facilities; however, no facility in the immediate area of either the Ana Maria well or Club de Leones well had VOC contamination detected in both soil and ground water samples [Figure 2; Ref. 19, pp. 13-14, 34-35, 37-38; 22, pp. 39, 42, 45; 25, pp. 9, 18, 21].

EPA Sampling Event – Ground Water Samples: July 2006

In July 2006, EPA collected ten ground water samples from nine PRASA-operated public supply wells, three ground water samples from three private wells, and pre- and post-treatment aqueous samples from the Boqueron Filtration Plant [Ref. 7, pp. 3-5, 9-15, 18-21; 8, pp. 248-257; 9, pp. 7-17]. Samples CR-GW04, and CR-GW14 were collected from the Ana Maria well, sample CR-GW06 was collected from the Club de Leones well; and background samples CR-GW02 and CR-GW03 were collected from the Cabo Rojo 2 and Cabo Rojo 3 wells, respectively [Ref. 7, p. 5; 9, pp. 7-17]. EPA validated the trace volatile organic compounds (VOCs) data according to Standard Operating Procedure (SOP) HW-34 (Revision 0), "USEPA Region II Data Validation SOP for Statement of Work SOM01.1" [Ref. 8, pp. 1-31]. EPA found the VOC data to be valid and acceptable, including meeting the Contract Required Quantitation Limit (CRQL) requirements [Ref. 8, pp. 1-31].

Ground water sample CR-GW04, collected from the Ana Maria well indicated PCE (1.9 µg/L), TCE (0.63 µg/L), and cis-1,2-DCE (0.67 µg/L) [Ref. 7, pp. 5, 7; 8, pp. 1-34, 51, 52, 251; 9, p. 10]. Duplicate sample CR-GW14, also collected from the Ana Maria well revealed similar detections of PCE (1.9 µg/L), TCE (0.62 µg/L), and cis-1,2-DCE (0.66 µg/L) [Ref. 7, pp. 5, 7; 8, pp. 1-34, 69-70, 251; 9, p. 10]. Ground water sample CR-GW06, which was collected from the Club de Leones well, indicated the presence of 1,1-DCE at 0.96 µg/L [Ref. 7, p. 5; 8, p. 1-34, 57, 252; 9, p. 10]. Chlorinated solvents were not detected in any other ground water samples collected in July 2006, including ground water samples CR-GW02 and CR-GW03, collected from public supply wells Cabo Rojo 2 and Cabo Rojo 3, respectively [Ref. 7, pp. 5, 7; 8, pp. 1-34, 42-80, 248-250; 9, pp. 7-17; 32, p. 6]. Ground water samples CR-GW02 and CR-GW03 indicated non-detect values for PCE, TCE, cis-1,2-DCE, and 1,1-DCE; therefore those samples were chosen to demonstrate background ground water conditions [Ref. 7, pp. 5, 7; 8, pp. 1-34, 45-46, 48-49, 250; 9, p. 10; 32, p. 6].

| <u>Hazardous Substance</u> | <u>Evidence</u> | <u>CRQL* (µg/L)</u> | <u>Reference(s)</u> |
|----------------------------|---------------------|---------------------|---------------------|
| PCE | CR-GW04 (1.9 µg/L) | 0.50 | 8, pp. 52, 251 |
| | CR-GW14 (1.9 µg/L) | 0.50 | 8, pp. 70, 251 |
| | CR-GW02 (0.50 U)** | 0.50 | 8, pp. 2, 46, 250 |
| | CR-GW03 (0.50 U)** | 0.50 | 8, pp. 2, 49, 250 |
| TCE | CR-GW04 (0.63 µg/L) | 0.50 | 8, pp. 52, 251 |
| | CR-GW14 (0.62 µg/L) | 0.50 | 8, pp. 70, 251 |
| | CR-GW02 (0.50 U)** | 0.50 | 8, pp. 2, 46, 250 |
| | CR-GW03 (0.50 U)** | 0.50 | 8, pp. 2, 49, 250 |
| Cis-1,2-DCE | CR-GW04 (0.67 µg/L) | 0.50 | 8, pp. 51, 251 |
| | CR-GW14 (0.66 µg/L) | 0.50 | 8, pp. 69, 251 |
| | CR-GW02 (0.50 U)** | 0.50 | 8, pp. 2, 45, 250 |

| | | | |
|---------|---------------------|------|-------------------|
| | CR-GW03 (0.50 U)** | 0.50 | 8, pp. 2, 48, 250 |
| 1,1-DCE | CR-GW06 (0.96 µg/L) | 0.50 | 8, pp. 57, 252 |
| | CR-GW02 (0.50 U)** | 0.50 | 8, pp. 2, 45, 250 |
| | CR-GW03 (0.50 U)** | 0.50 | 8, pp. 2, 48, 250 |

- U - The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted CRQL for sample and method [Ref. 8, p. 2; 32, p. 6]
- * - The sample analyses were performed under the EPA Contract Laboratory Program (CLP), and the Sample Quantitation Limits (SQL) are not established; therefore, the CRQLs are used in place of the SQLs to establish the observed release [Ref. 1, p. 51589; 33, p. 8]
- ** - background concentration

EPA Sampling Event – Ground Water Samples: September 2009

EPA collected five ground water samples from four PRASA-operated public supply wells in September 2009 [Ref. 14, pp. 4-5; 15, pp. 3-4, 6, 8; 16, p. 25]. The samples were analyzed for TCL VOCs through the EPA CLP [Ref. 15, pp. 3, 8; 16, pp. 1-19]. Samples CRGC-GW01 and CRGC-GW02 were collected from the Ana Maria well, sample CRGC-GW03 was collected from the Club de Leones well, and designated background samples CRGC-GW04 and CRGC-GW05 were collected from the Cabo Rojo 2 and Cabo Rojo 3 wells, respectively [Ref. 14, pp. 4-5; 15, pp. 4, 6; 16, p. 25]. EPA validated the trace VOCs data according to SOP HW-34 (Revision 0), "USEPA Region II Data Validation SOP for Statement of Work SOM01.1" [Ref. 16, pp. 1, 20-24]. EPA found the VOC data to be valid and acceptable, including meeting the CRQL requirements [Ref. 16, pp. 1, 20-24].

| <u>Hazardous Substance</u> | <u>Evidence</u> | <u>CRQL* (µg/L)</u> | <u>Reference(s)</u> |
|----------------------------|----------------------|---------------------|---------------------|
| PCE | CRGC-GW01 (1.1 µg/L) | 0.50 | 16, pp. 3, 25 |
| | CRGC-GW02 (1.1 µg/L) | 0.50 | 16, pp. 6, 25 |
| | CRGC-GW04 (0.50 U)** | 0.50 | 16, pp. 15, 20, 25 |
| | CRGC-GW05 (0.50 U)** | 0.50 | 16, pp. 18, 20, 25 |

- U - The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted CRQL for sample and method [Ref. 16, p. 20; 32, p. 6].
- * - The sample analyses were performed under the EPA CLP, and the SQLs are not established; therefore, the CRQLs are used in place of the SQLs to establish the observed release [Ref. 1, p. 51589; 33, p. 8]
- ** - background concentration

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A source hazardous waste quantity; therefore, hazardous constituent quantity is not scored (NS).

Hazardous Constituent Quantity (C) Value: NS

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B source hazardous waste quantity; therefore, hazardous wastestream quantity is not scored.

Hazardous Wastestream Quantity (W) Value: NS

2.4.2.1.3 Volume

Because there are wells with samples showing contamination in the ground water but the volume of the contaminated area has not been determined, the volume of the ground water contamination is considered to be greater than 0 cubic yards but unknown [Ref. 8, pp. 51-52, 57; 16, pp. 2-3, 5-6, 11]. Therefore, volume (V) is assigned a value of >0 but unknown [Ref. 1, p. 51591].

Dimension of source (yd³): >0

Volume (V) Assigned Value: >0

2.4.2.1.4 Area

Tier D, Area is not evaluated for source type "Other" [Ref. 1, p. 51591; Table 2-5].

Area of source (ft²): N/A

Area (A) Assigned Value: 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value for Source 1 is >0 but unknown for Tier C - Volume [Ref. 1, p. 51591].

Source Hazardous Waste Quantity Value: >0

SITE SUMMARY OF SOURCE DESCRIPTIONS

| <u>Source Number</u> | Source Hazardous Waste <u>Quantity Value</u> | <u>Ground Water</u> | <u>Containment</u> | | |
|--------------------------|--|-------------------------|--------------------------|------------|----------------------------|
| | | | <u>Surface Water</u> | <u>Gas</u> | <u>Air Particulate</u> |
| 1 | >0 | 10 | NS | NS | NS |

NS = Not Scored

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 General Considerations

The Cabo Rojo Ground Water Contamination site is located within the east-southeast trending Guanajibo River Valley, one of the largest of a series of alluvial valleys that occur within the West Coast (ground water) Province [Ref. 28, pp. 14, 21]. The vertical sequence of stratigraphic units within the Guanajibo Valley includes unconsolidated alluvial (sand, gravel, and clayey sand) and marginal marine deposits underlain by limestone and volcanoclastic igneous bedrock [Ref. 28, pp. 21, 23; 30, pp. 14-15]. The transmissivity associated with the Ana Maria well is 1,400 square feet per day (ft^2/day) and the transmissivity of the Club de Leones well is $1,300 \text{ ft}^2/\text{day}$ [Ref. 30, pp. 5, 10, 22]. In addition, the hydraulic conductivity associated with the Ana Maria well is 3.08×10^{-3} centimeters per second (cm/sec) and the hydraulic conductivity associated with the Club de Leones well is $7.64 \times 10^{-3} \text{ cm}/\text{sec}$ [Ref. 30, pp. 5, 10, 22; 61, p. 1]. PRASA supply wells associated with the Cabo Rojo Ground Water Contamination site (i.e., Ana Maria, Club de Leones, Cabo Rojo 2, and Cabo Rojo 3) are finished in the bedrock aquifer [Ref. 30, pp. 9-10, 15].

Geologic cross-sections for the Cabo Rojo region published by the U.S. Geological Survey (USGS), confirm that there is not a continuous confining layer separating the alluvial valley aquifer and the bedrock aquifer within 2 miles of the ground water plume; therefore, the alluvium and bedrock aquifers are evaluated as one hydrogeologic unit [Ref. 1, p. 51595; 30, pp. 9, 15-16]. Furthermore, as stated above, the hydraulic conductivity of the limestone and volcanoclastic igneous bedrock are similar [Ref. 1, p. 51595, 51601; 30, pp. 5, 10, 22; 61, p. 1]. The direction of ground water flow in the vicinity of the site is influenced by a cone of depression toward public supply wells (i.e., Cabo Rojo 2, Cabo Rojo 3, and Club de Leones) located in the vicinity of the low-lying Cienaga de Cuevas/Bajura area [Figure 2; Ref. 4, p. 1; 30, pp. 7-10, 16-17].

Ana Maria, Club de Leones, Cabo Rojo 2, and Cabo Rojo 3 are all finished in the bedrock aquifer [Ref. 30, pp. 9-10, 15]. Bottom elevations of the wells range from 143 to 236 feet above mean sea level (AMSL), and the screened intervals presented range in elevation from 33 to 236 feet AMSL; however the pump depths for the wells are similar (133-149 feet AMSL) [Ref. 13, pp. 1, 11, 13; 30, p. 10]. The interconnected water supply system consisting of Hacienda la Margarita, Cabo Rojo 1, Cabo Rojo 2, Cabo Rojo 3, and Club de Leones serve an estimated population of 45,055 people [Ref. 6, pp. 1, 3]. The Ana Maria well acts as an independent system which serves approximately 1,856 persons [Ref. 6, pp. 1-2]. Wellhead Protection Areas are delineated for the contaminated public supply wells, so the plume lies within a designated Wellhead Protection Area [Ref. 10, pp. 32-48; 11, p. 1; 59, p. 1].

Stratum 1 (shallowest)

Stratum Name: Alluvium

Description: The alluvium in the Guanajibo River Valley consists of Quaternary-age gravels, sands, and clayey sands [Ref. 30, p. 6]. The thickness of these deposits in the Guanajibo Valley is reported to be as much as 105 feet [Ref. 29, p. 11]. Ground water exists under water-table conditions and recharges the underlying bedrock [Ref. 30, p. 16].

Stratum 2/Aquifer

Stratum/Aquifer Name: Igneous and Limestone Bedrock

Description: The bedrock underlying the alluvium consists of the Cretaceous-age Cotuí Limestone and undifferentiated igneous and volcanoclastic rocks [Ref. 28, p. 21; 30, pp. 6, 15]. Ground water exists under water-table conditions and is recharged from the overlying intergranular surficial deposits (i.e., the alluvium) [Ref. 30, p. 16]. Ground water movement is towards a cone of depression produced by the pumping of water supply wells Cabo Rojo 2, Cabo Rojo 3, and Club de Leones [Ref. 30, pp. 10, 16-17].

3.1 LIKELIHOOD OF RELEASE

3.1.1 Observed Release

Aquifer Being Evaluated: Bedrock aquifer

An observed release is documented for the Cabo Rojo Ground Water Contamination site. Chemical analyses for ground water samples collected from the Ana Maria and Club de Leones public supply wells in 2006 and 2009 show the continuing presence of chlorinated solvents [Ref. 7, p. 5; 8, pp. 51-52, 57, 69-70; 9, p. 10; 14, p. 5; 15, p. 4; 16, pp. 3, 6, 11].

All background and contaminated samples documenting the observed release were collected from the aquifer being evaluated (i.e., Ana Maria and Club de Leones wells are all finished in the same hydrologic unit (i.e., the bedrock aquifer) [Ref. 30, pp. 7-16]. Samples from the Cabo Rojo 2 and Cabo Rojo 3 wells are evaluated as representative of background conditions due to similar pump depths to the wells where observed releases occurred [Ref. 13, pp. 1, 4, 13; 14, p. 3]. The chlorinated solvents found in the release wells are not naturally occurring, and the non-detect concentrations in background wells Cabo Rojo 2 and Cabo Rojo 3 show that the compounds are not ubiquitous in the area [Ref. 8, pp. 45-46, 48-49; 16, pp. 14-15, 17-18]. The background samples from Cabo Rojo 2 and Cabo Rojo 3 were collected within the same general timeframe as the release samples from Ana Maria and Club de Leones (July 2006 and September 2009) [Ref. 7, p. 5; 9, p. 10; 14, p. 5; 15, p. 4].

Chemical Analysis

EPA Sampling Event – Ground Water Samples: July 2006

In July 2006, EPA collected ten ground water samples from nine PRASA-operated public supply wells, three ground water samples from three private wells, and pre- and post-treatment aqueous samples from the Boqueron Filtration Plant [Ref. 7, pp. 3-5, 9-15, 18-21; 9, pp. 7-17]. Chain of custody of the samples was maintained throughout sample shipping, collection, and analysis [Ref. 8, pp. 1, 243-257; 16, pp. 1, 25]. The samples were analyzed for TCL and TAL parameters through the EPA CLP [Ref. 7, p. 4; 8, p. 1]. Samples CR-GW04 and CR-GW14 were collected from the Ana Maria well, sample CR-GW06 was collected from the Club de Leones well, and background samples CR-GW02 and CR-GW03 were collected from Cabo Rojo 2 and Cabo Rojo 3, respectively [Ref. 7, p. 5; 9, pp. 7-17]. EPA validated the trace VOCs data according to SOP HW-34 (Revision 0), "USEPA Region II Data Validation SOP for Statement of Work SOM01.1" [Ref. 8, pp. 2-31]. EPA found the VOC data to be valid and acceptable, including meeting the CRQL requirements [Ref. 8, pp. 2-31].

EPA Sampling Event – Ground Water Samples: September 2009

EPA collected five ground water samples from four PRASA-operated public supply wells in September 2009 [Ref. 14, pp. 4-5; 15, pp. 3-4, 8]. The samples were analyzed for TCL VOCs through the EPA CLP [Ref. 14, p. 4; 15, pp. 3, 8; 16, p. 20]. Samples CRGC-GW01 and CRGC-GW02 were collected from the Ana Maria well, sample CRGC-GW03 was collected from the Club de Leones well, and designated background samples CRGC-GW04 and CRGC-GW05 were collected from Cabo Rojo 2 and Cabo Rojo 3, respectively [Ref. 14, pp. 4-5; 15, p. 4]. EPA validated the trace VOCs data according to SOP HW-34 (Revision 0), "USEPA Region II Data Validation SOP for Statement of Work SOM01.1" [Ref. 16, pp. 20-24]. EPA found the VOC data to be valid and acceptable, including meeting the CRQL requirements [Ref. 16, pp. 20-24].

Background Concentrations (Public Supply Wells)EPA Sampling Events – Ground Water Samples: July 2006 and September 2009

| <u>Well Location</u> | <u>Screened Interval (ft AMSL)</u> | <u>Sample ID</u> | <u>Sample Date</u> | <u>Reference(s)</u> |
|----------------------|--|-------------------|------------------------|---|
| Cabo Rojo 2 | 33 to 143** | CR-GW02 (B3S25) | 07/12/06 | 7, p. 5; 8, p. 250; 9, p. 10; 13, p. 1 |
| | | CRGC-GW04 (B5Q97) | 09/02/09 | 14, p. 4; 15, p. 4; 16, p. 25 |

| <u>Sample ID</u> | <u>Hazardous Substance</u> | <u>Conc. (µg/L)</u> | <u>CRQL* (µg/L)</u> | <u>Reference(s)</u> |
|------------------|----------------------------|---------------------|---------------------|---------------------|
| CR-GW02 | PCE | 0.50 U | 0.50 | 8, pp. 2, 46 |
| | TCE | 0.50 U | 0.50 | 8, pp. 2, 46 |
| | cis-1,2-DCE | 0.50 U | 0.50 | 8, pp. 2, 45 |
| | 1,1-DCE | 0.50 U | 0.50 | 8, pp. 2, 45 |
| CRGC-GW04 | PCE | 0.50 U | 0.50 | 16, pp. 15, 20 |
| | 1,1-DCE | 0.50 U | 0.50 | 16, pp. 14, 20 |

| <u>Well Location</u> | <u>Screened Interval (ft AMSL)</u> | <u>Sample ID</u> | <u>Sample Date</u> | <u>Reference(s)</u> |
|----------------------|--|-------------------|------------------------|---|
| Cabo Rojo 3 | 33 to 143** | CR-GW03 (B3S26) | 07/12/06 | 7, p. 5; 8, p. 250; 9, p. 10; 13, p. 1 |
| | | CRGC-GW05 (B5Q98) | 09/02/09 | 14, p. 5; 15, p. 4; 16, p. 25 |

| <u>Sample ID</u> | <u>Hazardous Substance</u> | <u>Conc. (µg/L)</u> | <u>CRQL* (µg/L)</u> | <u>Reference(s)</u> |
|------------------|----------------------------|---------------------|---------------------|---------------------|
| CR-GW03 | PCE | 0.50 U | 0.50 | 8, pp. 2, 49 |
| | TCE | 0.50 U | 0.50 | 8, pp. 2, 49 |
| | cis-1,2-DCE | 0.50 U | 0.50 | 8, pp. 2, 48 |
| | 1,1-DCE | 0.50 U | 0.50 | 8, pp. 2, 48 |
| CRGC-GW05 | PCE | 0.50 U | 0.50 | 16, pp. 18, 20 |
| | 1,1-DCE | 0.50 U | 0.50 | 16, pp. 17, 20 |

- U - The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted CRQL for sample and method [Ref. 8, pp. 2, 45-49; 16, pp. 14-18, 20; 32, p. 6]
- * - The sample analyses were performed under the EPA CLP, and the SQLs are not established; therefore, the CRQLs are used in place of the SQLs to establish the observed release [Ref. 1, p. 51589; 33, p. 8]
- ** - The screened depths are unknown; therefore, the maximum possible screened interval is presented [Ref. 13, p. 1]

Contaminated Samples (Public Supply Wells)EPA Sampling Event – Ground Water Samples: July 2006 and September 2009

| <u>Well Location</u> | <u>Screened Interval (ft AMSL)</u> | <u>Sample ID</u> | <u>Sample Date</u> | <u>Reference(s)</u> |
|----------------------|--|-------------------|------------------------|---|
| Ana Maria | 36 to 236 | CR-GW04 (B3S27) | 07/12/06 | 7, p. 5; 8, p. 251; 9, p. 10; 13, p. 1 |
| | | CR-GW14 (B3S37) | 07/12/06 | 7, p. 5; 8, p. 251; 9, p. 10 |
| | | CRGC-GW01 (B5Q93) | 09/02/09 | 14, p. 5; 15, p. 4; 16, p. 25 |
| | | CRGC-GW02 (B5Q94) | 09/02/09 | 14, p. 5; 15, p. 4; 16, p. 25 |

| <u>Sample ID</u> | <u>Hazardous Substance</u> | <u>Conc. (µg/L)</u> | <u>CRQL* (µg/L)</u> | <u>Reference(s)</u> |
|------------------|----------------------------|---------------------|---------------------|---------------------|
| CR-GW04 | PCE | 1.9 | 0.50 | 8, p. 52 |
| | TCE | 0.63 | 0.50 | 8, p. 52 |
| | cis-1,2-DCE | 0.67 | 0.50 | 8, p. 51 |
| CR-GW14 | PCE | 1.9 | 0.50 | 8, p. 70 |
| | TCE | 0.62 | 0.50 | 8, p. 70 |
| | cis-1,2-DCE | 0.66 | 0.50 | 8, p. 69 |
| CRGC-GW01 | PCE | 1.1 | 0.50 | 16, p. 3 |
| CRGC-GW02 | PCE | 1.1 | 0.50 | 16, p. 6 |

| <u>Well Location</u> | <u>Screened Interval (ft AMSL)</u> | <u>Sample ID</u> | <u>Sample Date</u> | <u>Reference(s)</u> |
|----------------------|--|------------------|------------------------|---|
| Club de Leones | 39 to 189 | CR-GW06 (B3S29) | 07/12/06 | 7, p. 5; 8, p. 251; 9, p. 10; 13, p. 1 |

| <u>Sample ID</u> | <u>Hazardous Substance</u> | <u>Conc. (µg/L)</u> | <u>CRQL* (µg/L)</u> | <u>Reference(s)</u> |
|------------------|----------------------------|---------------------|---------------------|---------------------|
| CR-GW06 | 1,1-DCE | 0.96 | 0.50 | 8, p. 57 |

* - The sample analyses were performed under the EPA CLP, and the SQLs are not established; therefore, the CRQLs are used in place of the SQLs to establish the observed release [Ref. 1, p. 51589; 33, p. 8]

Attribution:

In 2006, EPA launched the Cabo Rojo Site Discovery Initiative in order to identify potential hazardous waste sites in the vicinity of contaminated wells in Cabo Rojo [Ref. 26, p. 2]. During the initial phase of the Cabo Rojo Site Discovery Initiative, EPA collected ground water samples from seven public supply wells located in Cabo Rojo (Hacienda la Margarita, Cabo Rojo 1, Cabo Rojo 2, Cabo Rojo 3, Club de Leones, Ana Maria, and Remanzo), three privately owned wells (Lighthouse Tropical Inn, Mariola Bottled Water facility, and Schoenstatt Convent), and two wells from a neighboring PRASA system (Pozo III/Javieres and Pozo II/Hormigueros) [Ref. 7, pp. 3-7; 9, pp. 7-16]. A review of the analytical results confirmed the presence of chlorinated solvents in the Ana Maria and Club de Leones wells; chlorinated solvents were not detected in any of the other wells sampled [Ref. 7, p. 5; 8, pp. 42-86].

In order to initiate the task of identifying hazardous waste sites in the vicinity of confirmed ground water contamination, EPA conducted file searches at the offices of the Puerto Rico Environmental Quality Board (PREQB) and Puerto Rico Industrial Development Company (PRIDCO) to obtain information regarding hazardous waste storage practices and hazardous waste releases [Ref. 26, p. 2]. EPA also conducted an Internet search for listings of dry cleaning and automobile repair facilities in and around Cabo Rojo [Ref. 26, p. 2]. Based on the file and Internet searches, EPA compiled a complete list of facilities at which to conduct site reconnaissance activities [Ref. 26, p. 2]. In November and December 2006 EPA conducted site reconnaissance activities at 68 facilities within the municipality of Cabo Rojo [Ref. 9, pp. 18-40, 43-61; 26, pp. 8-33]. As a result of the Site Discovery Initiative, EPA identified fifteen facilities that required further investigation [Ref. 26, p. 34; 37, p. 1]. The 53 remaining facilities were mainly gas or service stations or retail facilities where there was evidence of use of only non-chlorinated substances, primarily excluded petroleum products [Ref. 26, pp. 8-33]. The fifteen facilities requiring further investigation were: four abandoned facilities where uncontained waste sources possibly exist, three dry cleaning facilities that use or were suspected of using chlorinated solvents, six mechanic shops where poor housekeeping or the usage of chlorinated solvents was observed or suspected, and two painting/print shops with partial outdoor operations and usage of chlorinated solvents [Ref. 26, pp. 8, 10-15, 20-22, 25-28].

In January 2007, EPA conducted source investigations at the fifteen facilities in Cabo Rojo identified as potential sources of the ground water contamination [Ref. 37, p. 1]. These investigations included the completion of fourteen Preliminary Assessment/Site Inspections (PA/SI); the location of one of the facilities (i.e., PRIDCO) was not confirmed and a PA/SI could not be conducted [Ref. 37, p. 1]. Of the fourteen facilities where PA/SI level investigations were completed, twelve investigations included collection of surface and subsurface soil and ground water samples [Ref. 37, p. 1]. EPA collected a total of 61 surface soil samples, 66 subsurface soil samples, and 28 ground water samples from twelve facilities in an effort to identify potential sources of ground water contamination [Ref. 18, pp. 3-5; 21, pp. 3, 5-6; 24, pp. 3-6; 38, pp. 3-4; 40, pp. 3-7; 42, pp. 3, 5; 45, pp. 3-7; 47, pp. 3-7; 52, pp. 3, 5; 54, pp. 3-5; 56, pp. 3-7]. Samples collected from nine of these facilities did not indicate the presence of chlorinated solvents in soil or ground water samples [Ref. 39, pp. 35-58; 41, pp. 37-93; 43, pp. 27-60; 44, pp. 117-122; 46, pp. 38-48, 202-246; 48, pp. 165-212; 50, pp. 30-59; 51, pp. 41-52; 53, 146-166; 55, pp. 41-61; 57, pp. 119-163]. Chlorinated solvents (i.e., PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride) were detected at the three remaining facilities [Ref. 19, pp. 13-14, 34-35, 37-38; 22, pp. 39, 42, 45; 25, pp. 9, 18, 21].

No facility in the immediate area of either the Ana Maria well or Club de Leones well had VOC contamination detected in both soil and ground water samples [Figure 2]. At the Extasy Q Prints (EQP) facility, ground water samples indicated the presence of PCE; however, there were no VOCs detected in surface or subsurface soil samples [Figure 2; Ref. 20, pp. 15-17; 21, pp. 6, 9; 22, pp. 39, 42, 45, 47-87]. At another nearby facility, Cabo Rojo Professional Dry Cleaners (CRPDC), surface and subsurface soil samples indicated the presence of PCE; however, PCE was not detected in the ground water samples [Figure 2; Ref. 23, p. 17; 24, pp. 4-5; 25, pp. 9, 18, 21, 27-37; 32, p. 6]. Conversely, both soil and ground water samples collected from the D'Elegant Fantastic Dry Cleaners (DFDC) facility indicated the presence of cis-1,2-DCE, TCE and PCE; however, the facility is not in close proximity to the Ana Maria well (i.e., the DFDC facility is located approximately 4,600 feet southwest of the well) and the CRPDC facility is located between the well and that facility [Figure 2; Ref. 18, pp. 4-5; 19, pp. 13-14, 34-35, 37-38]. Based on these considerations, the ground water contamination observed in the two public supply wells (i.e., Ana Maria and Club de Leones); is not known to be attributable to any specific source(s).

Descriptions of the three aforementioned facilities, including the results of the PA/SI investigations, are provided below:

1. Extasy Q Prints

The EQP facility is located in the Centro Comercial Ana Maria strip mall [Ref. 20, p. 9]. The facility is located in a mixed commercial/residential area and consists of a portion of a concrete building [Ref. 20, p. 12, 26, 28]. The strip mall houses other business, including a day care center, a pizzeria, and an electronics company [Ref. 20, p. 29]. A review of regulatory files and databases did not disclose any history of releases or other environmental concerns [Ref. 20, p. 12].

Current operations at the facility consist of printing T-shirts, towels, and bags with varying designs [Ref. 20, p. 4]. The machinery used in the printing process is cleaned with water, petroleum-based cleaners, and rags [Ref. 20, pp. 4, 12]. Screens used in the printing process are possibly cleaned with liquids that contain VOCs, including PCE [Ref. 20, pp. 4, 12]. EQP has been in operation at this location since approximately 1986 [Ref. 20, p. 4].

On December 1, 2006 and April 4, 2007, EPA conducted site reconnaissance activities at the EQP facility [Ref. 20, pp. 4-5, 9-11]. EPA observed that outdoor screen washing practices, where wash solutions enter a sink, discharges to the ground [Ref. 20, pp. 4, 47-48]. The wash area is multi-colored from washing paints from the screens [Ref. 20, pp. 47].

On June 19 and 20, 2007, EPA conducted a sampling event at the EQP facility [Ref. 20, pp. 14-23, 51-55]. During this event, EPA collected surface soil, subsurface soil, and ground water samples from borings advanced using direct-push technology [Ref. 20, pp. 15-23]. Samples were analyzed for TCL VOCs through the EPA CLP [Ref. 20, pp. 18-19; 21, pp. 3, 12-14; 22, pp. 1-32]. Analytical results from this sampling event indicated detections of VOCs in ground water samples; there were no detections of VOCs in surface or subsurface soil samples [Ref. 22, pp. 47-88]. Ground water samples EQP-GW04, EQP-GW05, and EQP-GW06 indicated the presence of PCE (8.9 µg/L, 14 µg/L, and 13 µg/L, respectively) in ground water samples from two boreholes advanced between the EQP facility and the Ana Maria well [Ref. 20, pp. 15-17; 21, pp. 6, 9; 22, pp. 39, 42, 45].

2. Cabo Rojo Professional Dry Cleaners

The CRPDC facility consists of a single-story building and a paved parking lot with a few small areas of exposed soil and vegetation [Ref. 23, pp. 25, 37]. The site is located in a mixed commercial/residential area in the town of Cabo Rojo [Ref. 23, p. 24]. CRPDC is a privately owned and operated family business [Ref. 23, p. 6]. The history of the facility before CRPDC began operating in approximately 1987 is unknown [Ref. 23, p. 7]. A review of regulatory files and databases did not disclose any history of releases or other environmental concerns [Ref. 23, p. 15].

On November 29, 2006 and April 4, 2007, EPA conducted site reconnaissance activities at the CRPDC facility [Ref. 23, pp. 4, 6-7, 13-16]. Current operations at the facility include laundry and dry cleaning [Ref. 23, p. 6]. CRPDC uses PCE solvent in its dry-cleaning operation and generates PCE-contaminated sludge as a waste material [Ref. 23, pp. 6-8]. The facility is registered as a hazardous waste handler (EPA ID No. PRR000013433) [Ref. 34, p. 1].

EPA conducted a sampling event at and in the vicinity of the CRPDC site on June 20 and 22, 2007 [Ref. 23, pp. 16-21, 30-35, 42-45; 24, p. 3]. During this event, surface soil, subsurface soil, and ground water samples were collected from borings advanced using direct-push technology and manually using a stainless-steel auger [Ref. 23, pp. 16-21, 30-35, 42-45; 24, p. 3]. Samples were analyzed for TCL VOCs through the EPA CLP [Ref. 24, pp. 2, 11-12, 14; 25, pp. 50-85]. Analytical results from this sampling event indicated the presence of VOCs in surface soil and subsurface soil samples [Ref. 25, pp. 9, 18, 21]. Surface soil samples CRPDC-S02 and CRPDC-S03 indicated the presence of PCE (23 µg/kg and 29 µg/kg, respectively) and subsurface soil sample CRPDC-SS10 indicated an estimated concentration of PCE (73 J µg/kg) [Ref. 23, p. 17; 24, pp. 4-5; 25, pp. 9, 18, 21; 32, p. 6]. The site-related chlorinated solvent, PCE, was detected at only trace amounts (i.e., below the CRQL) in ground water samples collected at the CRPDC facility [Ref. 24, pp. 5, 6; 25, pp. 26-36].

3. D'Elegant Fantastic Dry Cleaners

The DFDC facility is located in the southern portion of the Centro Comercial La 100 strip mall, outside the immediate area of the Ana Maria and Club de Leones wells [Figures 1 and 2; Ref. 17, p. 6, 25, 27]. In addition to the DFDC facility, the strip mall has two restaurants, a hair salon, a bakery, three empty units, and is surrounded by asphalt with parking areas on the northern and eastern side [Ref. 17, p. 27]. Current and historical operations include dry cleaning and

spot cleaning of clothing [Ref. 17, pp. 6, 7]. The dry cleaning and spot cleaning operations use Dowper, commonly referred to as PCE, and Tar Go Dry, a product that contains multiple VOCs, including TCE [Ref. 17, pp. 6, 8].

DFDC has been in operation at this location since 2005 [Ref. 17, p. 6]. Previously, Modern Man Dry Cleaning operated at this location under Resource Conservation and Recovery Act (RCRA) Permit ID No. PRN008009185 [Ref. 17, p. 6; 35, p. 1; 36, pp. 1-2]. The owner of DFDC indicated that Modern Man Dry Cleaning was in operation for many years; however, the exact duration of operation is unknown [Ref. 17, pp. 6, 7]. The DFDC CERCLA ID No. and Modern Man Cleaners RCRA Permit ID No. are the same [Ref. 35, p. 1; 36, p. 2].

On November 29, 2006 and April 4, 2007, EPA conducted site reconnaissance activities of the DFDC facility accompanied by DFDC personnel [Ref. 17, pp. 4, 6-7, 16-17, 25-29]. An empty 55-gallon PCE drum was being stored outside the side door of the facility on a concrete pad [Ref. 17, pp. 16, 28]. All storage and work areas were observed to be in good condition with no apparent spills or discharges [Ref. 17, p. 28]. EPA observed that there are no monitoring wells at the site [Ref. 17, p. 7].

On June 15, 2007, EPA conducted a sampling event at the DFDC facility [Ref. 17, pp. 20-23; 43-44]. During this event, EPA personnel collected surface soil, subsurface soil, and ground water samples from borings advanced using direct-push technology [Ref. 17, pp. 20-23; 43-44; 18, pp. 3, 10; 19, pp. 1-8]. Samples were analyzed for TCL VOCs through the EPA CLP [Ref. 19, p. 9]. Analytical results from this sampling event indicated detections of VOCs in soil and ground water samples [Ref. 18, pp. 4-5; 19, pp. 13-14, 34-35, 37-38]. Trans-1,2-DCE (29 micrograms per kilogram) ($\mu\text{g}/\text{kg}$), cis-1,2-DCE (230 $\mu\text{g}/\text{kg}$), TCE (130 $\mu\text{g}/\text{kg}$), and PCE (36 $\mu\text{g}/\text{kg}$) were detected in soil sample DFDC-S02, collected just outside the side door of the operations portion of the facility [Ref. 17, pp. 21, 33-34, 43; 18, p. 4; 19, pp. 13-14; 32, p. 6]. In addition, ground water samples DFDC-GW02 and DFDC-GW03 collected from the same borehole location indicated the presence of cis-1,2-DCE (310 $\mu\text{g}/\text{L}$), TCE (68 $\mu\text{g}/\text{L}$) and PCE (67 $\mu\text{g}/\text{L}$) [Ref. 17, pp. 21-23, 44; 18, p. 5; 19, pp. 34-35]. Although both soil and ground water samples collected from the DFDC facility indicated the presence of cis-1,2-DCE, TCE and PCE, the facility is not in close proximity to the Ana Maria well (i.e., the DFDC facility is located approximately 4,600 feet southwest of the well) [Figure 2; Ref. 18, pp. 4-5; 19, pp. 13-14, 34-35, 37-38]. The CRPDC facility is located between the Ana Maria well and the DFDC facility, and ground water samples collected at the CRPDC facility did not indicate the presence of site-related chlorinated solvents at higher than trace levels (i.e., if detected, were detected below the CRQL [Figure 2; Ref. 24, pp. 5, 6; 25, pp. 26-36]).

Hazardous Substances Released:

Tetrachloroethylene (PCE)
Trichloroethylene (TCE)
cis-1,2-Dichloroethylene (cis-1,2-DCE)
1,1-Dichloroethylene (1,1-DCE)

CAS No. 000127-18-4
CAS No. 000079-01-6
CAS No. 000156-59-2
CAS No. 000075-35-4

Ground Water Observed Release Factor Value: 550

3.2 WASTE CHARACTERISTICS

3.2.1 Toxicity/Mobility

| <u>Hazardous Substance</u> | <u>Source Numbers</u> | <u>Toxicity Factor Value</u> | <u>Mobility Factor Value</u> | <u>Toxicity/ Mobility</u> | <u>Reference(s)</u> |
|--------------------------------|---------------------------|----------------------------------|----------------------------------|-------------------------------|---------------------|
| Tetrachloroethylene | 1, OR | 100 | 1.0 | 100 | 2, p. 15 |
| Trichloroethylene | 1, OR | 10,000 | 1.0 | 10,000 | 2, p. 57 |
| cis-1,2-Dichloroethylene | 1, OR | 100 | 1.0 | 100 | 2, p. 10 |
| 1,1-Dichloroethylene | 1, OR | 100 | 1.0 | 100 | 2, p. 10 |

OR = Observed Release

Toxicity/Mobility Factor Value: 10,000

3.2.2 Hazardous Waste Quantity

| <u>Source Number</u> | <u>Source Hazardous Waste Quantity (HWQ) Value (Section 2.4.2.1.5)</u> | <u>Is source hazardous constituent quantity data complete? (yes/no)</u> |
|----------------------|--|---|
| 1 | >0 | No |

Sum of Values: >0 (rounded to nearest integer as specified in HRS Section 2.4.2.2)

The sum corresponds to a hazardous waste quantity factor value of 1 in Table 2-6 of the HRS [Ref. 1, p. 51591]. However, based on the fact that the source hazardous constituent quantity has not been adequately determined and that targets are subject to Level I and Level II concentrations (see Section 3.3.2.3 of this document), a hazardous waste quantity factor value of 100 can be assigned if it is greater than the hazardous waste quantity value from Table 2-6 (i.e., 1) [Ref. 1, pp. 51591- 51592]. Therefore, a hazardous waste quantity factor value of 100 is assigned for the ground water pathway.

3.2.3 Waste Characteristics Factor Category Value

TCE corresponds to the toxicity/mobility factor value of 10,000, as shown previously (see Section 3.2.1).

Toxicity/Mobility Factor Value (10,000) x Hazardous
Waste Quantity Factor Value (100): 1×10^6

The product (1×10^6) corresponds to a Waste Characteristics Factor Category Value of 32 in Table 2-7 of the HRS [Ref. 1, p. 51592].

1,1-DCE corresponds to the toxicity/mobility factor value of 100, as shown previously (see Section 3.2.1).

Toxicity/Mobility Factor Value (100) x Hazardous
Waste Quantity Factor Value (100): 1×10^4

The product (1×10^4) corresponds to a Waste Characteristics Factor Category Value of 10 in Table 2-7 of the HRS [Ref. 1, p. 51592].

Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 32

3.3 TARGETS

There are six active wells (Hacienda la Margarita, Cabo Rojo 1, Cabo Rojo 2, Cabo Rojo 3, Club de Leones, and Ana Maria) and one surface water source in the Cabo Rojo Urbano system [Ref. 6, p. 1]. The Ana Maria well is a separate single component that serves 680 houses. Therefore, the population served by the Ana Maria well is calculated, and subsequently rounded as follows:

$$680 \text{ households} \times 2.73 \text{ persons/household} = 1,856.4 = \\ 1,856 \text{ persons served by the Ana Maria well [Ref. 6, p. 1].}$$

The remaining five wells (all wells listed except Ana Maria) and surface water intake at a filtration plant are combined to serve the town of Cabo Rojo [Ref. 6, p. 1]. The relative contributions of each input to the Cabo Rojo Urbano system, ranging from 0.625 to 1.5 million gallons per day (MGD), are less than 40% (i.e., 2 MGD); therefore, the HRS states that the relative contribution of each component can be considered equal [Ref. 1, p. 51603; 6, pp. 1, 3].

After subtracting the population served by the Ana Maria well the total population of the system is divided by the total number of inputs [Ref. 6, p. 1]. The population served by the Club de Leones well is calculated, and subsequently rounded as follows:

$$46,911 \text{ total population} - 1,856 \text{ persons served by Ana Maria} = 45,055 \text{ people}$$

$$(5 \text{ wells} + 1 \text{ surface water source}) = 6 \\ 45,055 / 6 = 7,509.1 \\ = 7,509 \text{ persons served by the Club de Leones well [Ref. 6, p. 1]}$$

The populations and levels of contamination are presented below:

| Well | Distance from Source (mi.)* | Population | Level I Contam. (Y/N)** | Level II Contam. (Y/N)** | Potential Contam. (Y/N) | Reference(s) |
|----------------|-----------------------------|------------|-------------------------|--------------------------|-------------------------|--|
| Ana Maria | 0 | 1,856 | Y | N | N | [Fig. 1; Ref. 1, pp. 51593, 51595, 51603; 6, p. 1] |
| Club de Leones | 0 | 7,509 | N | Y | N | [Fig. 1; Ref. 1, pp. 51593, 51595, 51603; 6, p. 1] |

* The release wells (i.e., Ana Maria and Club de Leones) show an observed release. Therefore, the distance from the source is technically "0"; however, the distance from each release well (i.e., site reference point) to the center of the area of observed ground water contamination is 0.49 mile [Fig. 1; Ref. 1, pp. 51593, 51595; 6, p. 1].

** Several benchmarks can be considered for the ground water pathway, including Maximum Contaminant Level Goal (MCLGs), Maximum Contaminant Levels (MCLs), Cancer Risk Screen Concentration (CRSC), and Reference Dose Screen Concentration (RfD), to evaluate the level of contamination associated with contamination observed in the Ana Maria and Club de Leones wells [Ref. 1, p. 51593]. If the concentration of any applicable hazardous substance from any sample equals or exceeds its lowest applicable benchmark concentration, the sampling location is considered to be subject to Level I concentrations [Ref. 1, p. 51593]. Applicable benchmarks for the contaminants detected in the observed release, presented here in µg/L for consistency with reported data, are as follows:

GW-Targets

| <u>Substance</u> | <u>MCL/MCLG</u> | <u>RfD</u> | <u>CRSC</u> | <u>Reference(s)</u> |
|------------------|-----------------|------------|-------------|---------------------|
| PCE | 5 | 360 | 1.6 | 2, p. 31 |
| TCE | 5 | 11 | 0.21 | 2, p. 57 |
| cis-1,2-DCE | 70 | 360 | --- | 2, p. 25 |
| 1,1-DCE | 7 | 1800 | --- | 2, p. 25 |

See the next page for Level I concentrations detected in each well.

GW-Level I Concentrations

Level I Concentrations

| <u>Well</u> | <u>Sample</u> | <u>Substance</u> | <u>Conc. (µg/L)</u> | <u>Benchmark (µg/L)</u> | <u>Reference(s)</u> |
|------------------|---------------|------------------|---------------------|-------------------------|-----------------------------|
| Ana Maria | CR-GW04 | PCE | 1.9 | 1.6 (CRSC) | 2, p. 31; 7, p. 5; 8, p. 52 |
| | CR-GW04 | TCE | 0.63 | 0.21 (CRSC) | 2, p. 57; 7, p. 5; 8, p. 52 |
| | CR-GW14 | PCE | 1.9 | 1.6 (CRSC) | 2, p. 31; 7, p. 5; 8, p. 70 |
| | CR-GW14 | TCE | 0.62 | 0.21 (CRSC) | 2, p. 57; 7, p. 5; 8, p. 70 |

3.3.1 Nearest Well

As identified in Section 3.3 of this document, the drinking water well Ana Maria is subject to Level I concentrations. Therefore, a nearest well factor value of 50 is assigned [Ref. 1, pp. 51593, 51602-51603]. Also identified in Section 3.3 of this document, the drinking water well Club de Leones is subject to Level II concentrations; the nearest well factor value for that well is 45 [Ref. 1, pp. 51602-51603].

Nearest Well Factor Value: 50

3.3.2 Population

3.3.2.2 Level I Concentrations

As identified in Section 3.3 of this document, the drinking water well Ana Maria is considered Level I. The population assigned to each well is also explained in Section 3.3.

| <u>Level I Well</u> | <u>Population</u> | <u>Reference(s)</u> |
|---------------------|-------------------|---------------------|
| Ana Maria | 1,856 | [Ref. 6, p. 1] |

Population Served by Level I Wells: 1,856 Level I Concentrations Factor Value: 18,560

3.3.2.3 Level II Concentrations

As identified in Section 3.3 of this document, the drinking water well, Club de Leones is considered Level II. The population assigned to each well is also explained in Section 3.3.

| <u>Level II Well</u> | <u>Population</u> | <u>Reference(s)</u> |
|----------------------|-------------------|---------------------|
| Club de Leones | 7,509 | [Ref. 6, p. 1] |

Population Served by Level II Wells: 7,509 Level II Concentrations Factor Value: 7,509

3.3.2.4 Potential Contamination

Due to the fact that the maximum score of 100.00 for the ground water pathway is achieved, potential contamination was not scored.

Potential Contamination Factor Value: NS

3.3.3 Resources

Available information indicates that ground water extracted from the aquifer of concern within the 4-mile radius of the site is used as a resource (i.e., watering of commercial livestock). Therefore, a resources factor value of 5 is assigned [Ref. 1, p. 51604; 31, p. 19; 58, p. 1; 60, p. 1].

Resources Factor Value: 5

3.3.4 Wellhead Protection Area

The Wellhead Protection Program for Puerto Rico was developed in 1991 in accordance with Section 1428 of the Safe Drinking Water Act and subsequently approved by EPA [Ref. 10, pp. 1, 8-9; 11, p. 1]. Wellhead protection areas are defined by a fixed radius of 1,500 feet around each public supply well that does not withdraw water from the North Coast artesian limestone aquifer [Ref. 10, pp. 36, 40; 59, p. 1]. The wells associated with the Cabo Rojo Ground Water Contamination site (i.e., Ana Maria and Club de Leones) are located in the southwest region of Puerto Rico, outside of the North Coast artesian limestone aquifer, so the 1,500-foot fixed radius is applicable for the public supply wells within the target distance limit of the site [Ref. 10, pp. 8, 40; 59, p. 1]. Based on this information, observed ground water contamination associated with the site lies within a designated wellhead protection area (i.e., at the contaminated public supply wells), and a wellhead protection area factor value of 20 is assigned [Ref. 1, p. 51604].

Wellhead Protection Area Factor Value: 20

ATTACHMENT A

WELL-SPECIFIC SCORESHEETS

The Cabo Rojo Ground Water Contamination site consists of a ground water plume with no identified source(s) of contamination. The reference points for the site are two active public supply wells (Ana Maria and Club de Leones), with an observed release of contamination. These well-specific scoresheets, on a line by line basis, refer to the relevant page in the HRS documentation record where the values were determined and show that even if the two public supply wells were evaluated independently, they each would qualify for listing.

**GROUND WATER MIGRATION PATHWAY SCORESHEET
ANA MARIA WELL**

| GROUND WATER MIGRATION PATHWAY Factor Categories & Factors | MAXIMUM VALUE | VALUE ASSIGNED | HRS DOCUMENTATION RECORD PAGE |
|---|------------------|-------------------|-------------------------------------|
| Likelihood of Release to an Aquifer Aquifer: Bedrock Aquifer | | | |
| 1. Observed Release | 550 | 550 | pp. 13-14; 21-23 |
| 2. Potential to Release | | | |
| 2a. Containment | 10 | | |
| 2b. Net Precipitation | 10 | | |
| 2c. Depth to Aquifer | 5 | | |
| 2d. Travel Time | 35 | | |
| 2e. Potential to Release (lines 2a (2b+2c+2d)) | 500 | | |
| 3. Likelihood of Release | 550 | 550 | pp. 21-23 |
| Waste Characteristics | | | |
| 4. Toxicity/Mobility | * | 10,000 | p. 28 |
| 5. Hazardous Waste Quantity | * | 100 | p. 29 |
| 6. Waste Characteristics | 100 | 32 | p. 29 |
| Targets | | | |
| 7. Nearest Well | 50 | 50 | p. 33 |
| 8. Population | | | |
| 8a. Level I Concentrations | ** | 18,560 | p. 33 |
| 8b. Level II Concentrations | ** | NS | |
| 8c. Potential Contamination | ** | NS | |
| 8d. Population (lines 8a+8b+8c) | ** | 18,560 | |
| 9. Resources | 5 | 5 | p. 34 |
| 10. Wellhead Protection Area | 20 | 20 | p. 34 |
| 11. Targets (lines 7+8d+9+10) | ** | 18,635 | |
| 12. Targets (including overlaying aquifers) | ** | 18,635 | |
| 13. Aquifer Score (lines 3x6x12 divided by 82,500) | 100 | 100 | |
| GROUND WATER MIGRATION PATHWAY SCORE (Sgw) | 100 | 100.00 | |

* Maximum value applies to waste characteristics category.

** Maximum value not applicable.

**GROUND WATER MIGRATION PATHWAY SCORESHEET
CLUB DE LEONES WELL**

| GROUND WATER MIGRATION PATHWAY Factor Categories & Factors | MAXIMUM VALUE | VALUE ASSIGNED | HRS DOCUMENTATION RECORD PAGE |
|---|------------------|-------------------|-------------------------------------|
| Likelihood of Release to an Aquifer Aquifer: Bedrock Aquifer | | | |
| 1. Observed Release | 550 | 550 | pp. 13-14; 21-23 |
| 2. Potential to Release | | | |
| 2a. Containment | 10 | | |
| 2b. Net Precipitation | 10 | | |
| 2c. Depth to Aquifer | 5 | | |
| 2d. Travel Time | 35 | | |
| 2e. Potential to Release [lines 2a (2b+2c+2d)] | 500 | | |
| 3. Likelihood of Release | 550 | 550 | pp. 21-23 |
| Waste Characteristics | | | |
| 4. Toxicity/Mobility | ** | 100 | p. 28 |
| 5. Hazardous Waste Quantity | * | 100 | p. 29 |
| 6. Waste Characteristics | 100 | 10 | p. 29 |
| Targets | | | |
| 7. Nearest Well | 50 | 45 | p. 33 |
| 8. Population | | | |
| 8a. Level I Concentrations | ** | NS | p. 33 |
| 8b. Level II Concentrations | ** | 7,509 | |
| 8c. Potential Contamination | ** | NS | |
| 8d. Population (lines 8a+8b+8c) | ** | 7,509 | |
| 9. Resources | 5 | 5 | p. 34 |
| 10. Wellhead Protection Area | 20 | 20 | p. 34 |
| 11. Targets (lines 7+8d+9+10) | ** | 7,579 | |
| 12. Targets (including overlaying aquifers) | ** | 7,579 | |
| 13. Aquifer Score (lines 3x6x12 divided by 82,500) | 100 | 100 | |
| GROUND WATER MIGRATION PATHWAY SCORE (Sgw) | 100 | 100.00 | |

- * Maximum value applies to waste characteristics category.
 ** Maximum value not applicable.